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ABSTRACT

University Primary School (UPS) is an early childhood gifted program affiliated with the University of Illinois at Urbana-Champaign. This paper highlights three innovative uses of technology at UPS: Knowledge Web pages, photo portfolios, and Chickscope. The Knowledge Web pages are a collection of Web pages that serve as a virtual bulletin board for the students' project work. This virtual bulletin board extends the classroom to the home where parents can view their child's work. Photography, including the use of a digital camera, has enhanced the ability of the teachers to document the learning that occurs in a project-based curriculum. Photo portfolios document areas of growth that are not easily captured by traditional measures of assessment. Chickscope enabled students in a K-1 classroom to control an MRI scanner at the National Center for Supercomputing Applications (NCSA) to study developing chicken embryos. This paper also describes ways in which children integrate the Internet into many aspects of their ongoing work. These examples of how UPS uses the latest in technology provide a starting point for many educators who are planning to integrate technology into their curriculum, program goals, and everyday activities. The paper's appendix lists computer resources needed to create the Knowledge Web pages. (LPP)

Connecting Families through Innovative Technology in an Early Childhood Gifted Program

Sharon Kristovich, Nancy B. Hertzog, & Marjorie Klein ■

Abstract

University Primary School (UPS) is an early childhood gifted program affiliated with the University of Illinois at Urbana-Champaign. This paper highlights three innovative uses of technology at UPS: Knowledge Web pages, photo portfolios, and Chickscope. The Knowledge Web pages are a collection of Web pages that serve as a virtual bulletin board for the students' project work. This virtual bulletin board extends the classroom to the home where parents can view their child's work. Photography, including the use of a digital camera, has enhanced the ability of the teachers to document the learning that occurs in a project-based curriculum. Photo portfolios document areas of growth that are not easily captured by traditional measures of assessment. Chickscope enabled students in a K/1 classroom to control an MRI scanner at the National Center for Supercomputing Applications (NCSA) to study developing chicken embryos. This paper also describes ways in which children integrate the Internet into many aspects of their ongoing work. These examples of how UPS uses the latest in technology provide a starting point for many educators who are planning to integrate technology into their curriculum, program goals, and everyday activities. ■

Introduction

The old adage that a "picture is worth a thousand words" is certainly true when it comes to capturing moments in a child's life. At University Primary School, we have been working diligently to "capture" and communicate the life and learning that occurs in our early childhood classrooms through innovative uses of technology. This paper highlights specifically three innovations in which we use the Internet and photography to connect our families to our school activities: "Knowledge Web pages," "photo portfolios," and "Chickscope."

University Primary School

University Primary School (UPS) is an early childhood gifted program affiliated with the Department of Special Education at the University of Illinois at Urbana-Champaign. There are three classrooms of approximately 25 students: one classroom of 3- and 4-year-olds, and two classrooms of kindergarten/first-graders. Each K/1 classroom is staffed with a head teacher and an assistant. The preschool classroom has two assistant teachers. Children are screened for the program using a portfolio approach. Portfolios include parent questionnaires, the results of student performance on the Kaufman Assessment Battery for Children (K-ABC) (Kaufman, 1983), an open-ended drawing activity, and samples of children's drawings, dictations, and writings in the portfolios.

UPS Curriculum

One predominant feature of the school is the project-based curriculum and "Activity Time" built into the day for students to pursue choices. Projects present learning to children in real-life contexts and integrate the acquisition and application of basic skills through inquiry modes of learning. Although much of the children's time is spent pursuing project investigations, small-group instruction at the K/1 level also includes special time periods for language and literacy and numeration and problem solving. The program emphasizes a whole language approach to literacy where children learn to read by reading and to write by writing. Math instruction focuses on relating math to real-life

situations using manipulatives and other concrete materials. Math and reading are also integrated throughout the pursuit of project investigations.

Computers

Computers are used at UPS as tools to enhance the students' learning. Children use the computers much as they are used in the adult world—to assist students in writing documents, to communicate with families (e-mail), and to locate resources for their investigations. The teachers use the computers for many of the same reasons. In our quest to document and communicate what the children are learning, we have expanded our use of computers to develop a home page and, with much parent support and creativity, design the Knowledge Web pages.

All of the UPS computers are Macintosh—we currently have four SE/30 Macintosh computers in the preschool classroom, ten SE/30 computers in one K/1 classroom, and seven in the other K/1 classroom. A Performa was purchased for each K/1 classroom with program funds and parent donations. Most all of the other computers are on "permanent loan" from other departments on the campus who have discarded them to upgrade their own systems. One parent took the initiative to be our computer and technology coordinator 2 years ago, and even though he no longer has a child in the program, has continued to serve as our technology coordinator and Webmaster. Each year, he trains other parents to maintain our computers. Without this sustained support and expertise of parent volunteers, UPS could not model innovative uses for technology.

Knowledge Web Pages

History and Rationale

The sections that follow discuss the use of the Internet and World Wide Web as an extension of the classroom bulletin boards. A series of Web pages called "Knowledge Web" pages were designed to increase communication among parents, teachers, and children. These "Knowledge Web" pages foster communication among parents, teachers, and students by displaying students' project work linked to the school's curriculum.

The "Knowledge Web" pages are an extension of the school's home page. The primary purpose of the school's home page is to provide parents with school contact information and community and Internet resources for gifted education. In addition to the parent resources, the home page also displays examples of classroom activities with digital photographs and scanned artwork. The school's home page was created and is maintained by the parent of a former student, who does not have regular contact with the teachers. As a result, some of the activities displayed on the home page are older. Parents of new students viewing the home page requested more student material on the Web pages, to improve their understanding of their child's school activities.

In addition to the request for more up-to-date student material on the Internet, parents were concerned with how the project work in the classroom related to the school's curriculum. They wanted to see how classroom projects addressed the school's curriculum topics of Social and Emotional Growth, Art and Aesthetics, Language Arts, Numeration and Problem Solving, and Activity Time. Rody (M. Rody, personal communication, February 25, 1996) created "curriculum webs" that identified the classroom learning domains addressed in project work on the classroom wall as the project was completed. The Knowledge Web pages extend Rody's curriculum web to identifying the curriculum areas addressed in specific classroom projects. Instead of using a classroom bulletin board, however, the Knowledge Web is displayed on the Internet, creating a "virtual bulletin board." With equipment such as a digital camera and scanners, media from the classroom can be displayed within a day of creation. Thus, the "Knowledge Web" pages are dynamic, and updates occurred at least once a week between January and May 1997. These Web pages provided the same advantage of viewing a classroom bulletin board in the convenience of parents' homes or offices.

Knowledge Web Components

The Knowledge Web pages are sets of project Web pages linked to the school's home page. A list of the hardware and software needed to create these Web pages can be found in the Appendix. There is one set per classroom project, and at this point, there are three K/1 projects (turtles, corn, and snack) and two preschool projects (puppet show and otters). The first page in the Knowledge Web is called the *Main Page*. The *Main Page* provides links to each represented project and an e-mail link for comments. Providing a "Mail Link" for feedback is essential for increasing communication between

parents, or other adult users, and the teaching staff. The *Main Page* also contains a copyright notation to safeguard unauthorized use and the date the pages were last updated to encourage return visits.

Each project in the K/1 classroom is depicted in a "frames" format, which appears on the Web browser as three simultaneously viewed pages. Figure 1 shows the "frames" format for the corn project.

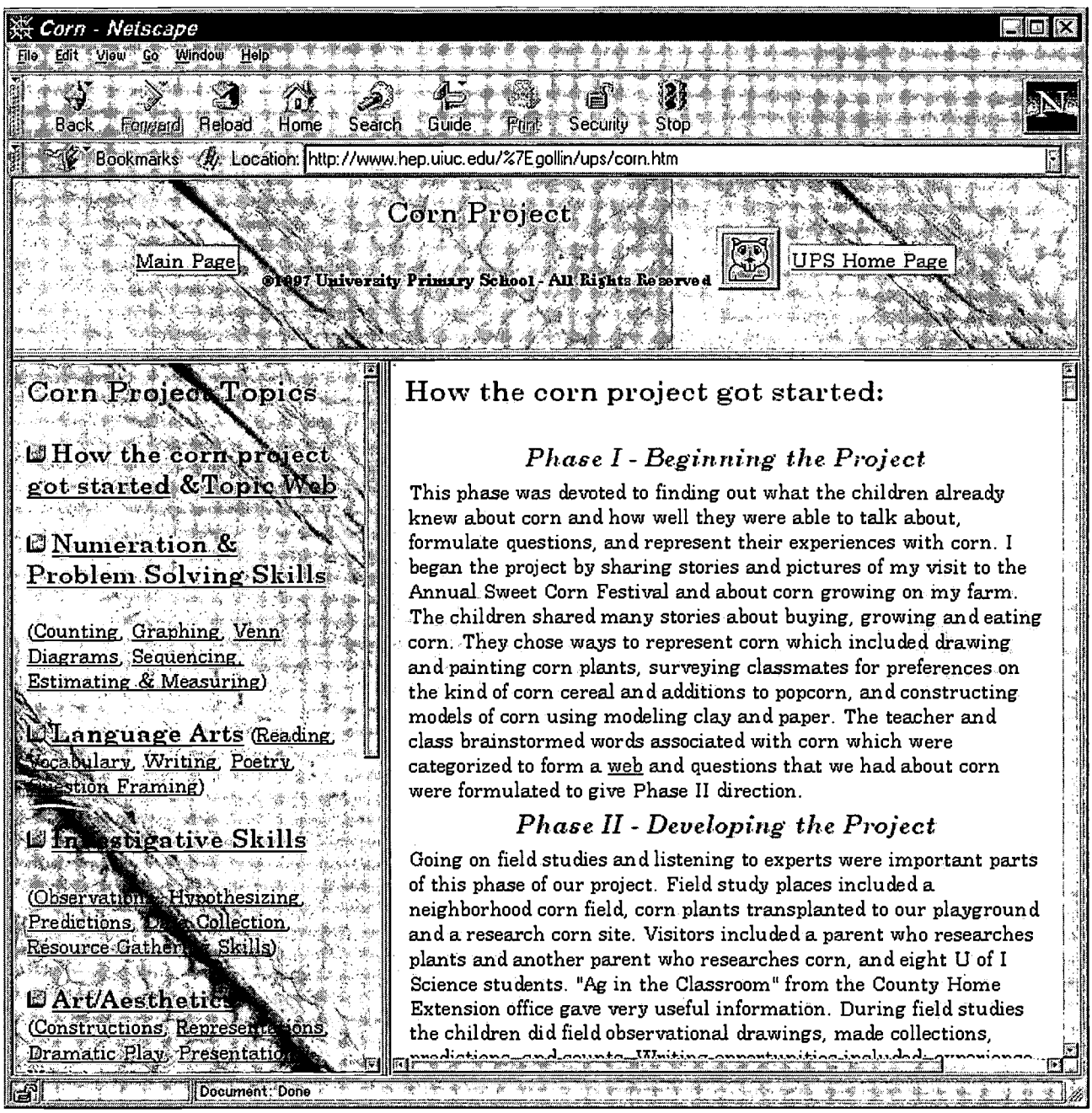


Figure 1. "Frames" format used on the Knowledge Web pages.

The first page at the top third of the screen, or *banner* page, contains the project title and links to the school's home page and the Knowledge Web main page. These links facilitate usage for adults and children by providing the user a quick way to go back and view another project or go to the

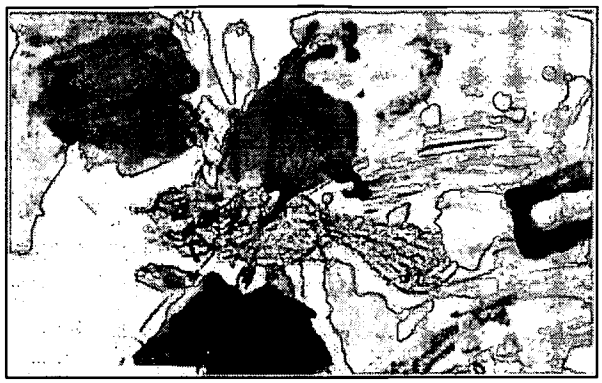
resources on the school's home page. The bottom two-thirds of the screen is divided into two sections and displays two pages: the *table of contents* and *materials* pages. The *table of contents* appears on the left half of the screen and lists the curriculum topics with links to project work in the *materials* page on the right half of the screen. The links are made with "bookmarks," which are highlighted keywords or icons that, when "pressed" by the user, change the material viewed in the browser. Thus, to view a series of examples on Art and Aesthetics, all a user has to do is press its icon in the *table of contents* page and examples appear in the *materials* page. Occasionally, some project-work examples are too large and are best viewed on a whole page. In those instances, a link to a full-screen view for those examples is provided. Thus, with the frames approach, a user can select a curriculum area, view examples, and move to a new curriculum area quickly and efficiently.

Media. In the Knowledge Web pages, there are over 60 examples of student work in the three K/1 projects. As a virtual gallery, the Knowledge Web pages display three types of media: photographs, scanned images, and protocols. The first two, photographs and scanned images, can often be found on classroom bulletin boards. The third type, protocols, are not usually displayed because the time required to tape and transcribe them makes them impractical.

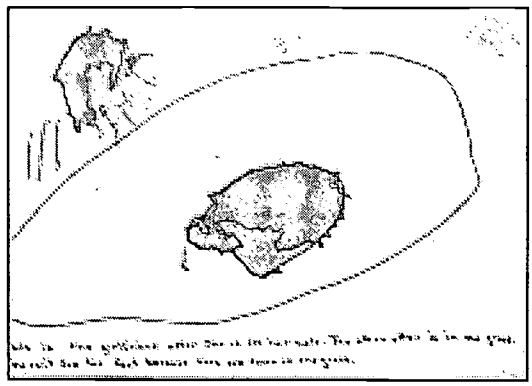
Photography is often used to display pictures of students' constructions, representations, and art-work as well as to capture classroom and group activities. The photographs displayed on the Knowledge Web pages are from still and digital cameras. Digital cameras create an electronic image that can be edited and viewed within minutes of taking the picture. Still-camera photographs must be developed either as a physical picture or as an electronic image, which delays their display time. Figure 2 shows some examples of the photography used in the Knowledge Web Pages.

Figure 2. Photography examples: group activities—K/1 corn.

A digital flatbed scanner is an invaluable tool for creating electronic (as well as print) media. The Knowledge Web pages use scanned images of artwork, original handwriting, sketches, surveys, charts, and graphs. The scanner works much like a color copier to quickly produce high-resolution images of students' original handiwork by creating an image that can be saved electronically or printed. Using the scanner allows for creating copies of student work, allowing originals to be returned. It also allows for simultaneous display of student work on the Internet and in the classroom. The majority of the examples on the Knowledge Web page were generated using a scanner and probably would not be available for display otherwise. Figure 3 provides some examples of scanned images in the Knowledge Web Pages.



He is going back in the water because he is scared. He is scared of a man chasing him. He is going to his home in the water. He is very, very nice. The sunshine is falling down.



This is the girlfriend otter. She is in her hole. The other otter is in the grass. You can't see his feet because they are down in the grass.

Figure 3. Examples of scanned media: artwork—preschool otter project.

Protocols such as typed transcriptions or audio sound bites, video clips of classroom activities, typed materials by students such as writing samples, and e-mail are all examples of communications made by students throughout the course of a school day. These communications are vital to the students' learning experiences but are often not available to parents. Figure 4 provides an example of an e-mail message displayed on the Knowledge Web page.

Date: Tue, 11 Feb 1997 08:45:43 -0600
>>X-Sender: deelen@mail.inhs.uiuc.edu
>>Mime-Version: 1.0
>>To: mv-burns@uiuc.edu (Marcia V. Burns)
>>From: deelen@denr1.igis.uiuc.edu (Timothy R. Van Deelen)
>>Subject: Re:Animal Snacks
>>
>>Good morning!
>>
>>Question number 1 (Do animals in the wild eat snack?):
>>
>>The short answer to this question is that some animals do and some
>>don't. Deer for example almost never eat large regular meals. They eat
>>nothing but snacks. When deer are feeding, they walk through the woods
>>stopping every once in a while to take a bite or two of some tasty-looking
>>plant. They never stand in one place and eat the whole plant because that
>>might kill the plant and prevent it from providing food next time.
>>Bears usually like to eat big meals when they can catch other animals
>>for food like salmon or deer. But these kinds of meals are infrequent. In
>>between meals, bears like to snack on berries, ants, and roots. One of
>>their favorite snacks is honey.
>>Large snakes like the python never snack. They eat large meals when
>>they can catch a smaller animal and swallow it whole. Their meals depend on
>>being able to sneak up and catch smaller animals. Since catching smaller
>>animals is difficult, pythons may wait several weeks between meals. (You'd
>>think they would want a snack).

Figure 4. Examples of typed media: e-mail—K/1 snack project.

Advantages and Value of the Knowledge Web

As the Knowledge Web pages were being developed, it became apparent that the concept of the virtual bulletin board has some advantages over the traditional classroom bulletin board. One advantage of the Knowledge Web is that there is no limit to the number of images. In addition, the electronic formatting is a quicker and more efficient method of displaying photography. These advantages are most prominent in the type of media that can be presented and in the communications among students, parents, and teachers.

Another advantage of the Knowledge Web pages was that they fostered communication among students and other adults (such as teachers and parents), among students, and among adults. First, the Web pages provided a catalyst for students' conversation about their project work. The classroom bulletin boards already are a useful medium to engage students in conversation about various classroom projects. However, the main audience for this conversation are teachers and other students because the bulletin boards are located only in the classroom. Parents often have less opportunity to view the displayed project work with their children. Creating a virtual bulletin board with the Knowledge Web pages provides parents with a means of viewing classroom project work with their children at home. It also allows parents to see project work without disruption. Parents can view these pages at home, at work, or anywhere they have Internet access. This convenience not only encourages parents to view more of the classroom activities, the predominant use of pictures and scanned images encourages viewing with their children, fostering communications and conversations.

The Knowledge Web pages not only encourage student–parent communication, they also encourage communication among students. The classroom computers are equipped with Web browsers with "bookmarks" to the school's home page and Knowledge Web. During Activity Time, students used these "bookmarks" as a starting point for Internet exploration. Thus, students could explore the Internet without an adult's assistance. Students enjoyed viewing their project work at school and were observed showing other children (and adults) how to use the browser to access the Internet and to conduct searches. It is not unusual to observe students viewing these Web pages with other students and parents and discussing the events surrounding the examples.

A final advantage of directly linking the curriculum to project work was realized during the construction of the Knowledge Web pages. The public nature of these Web pages encourages communication among colleagues and between parents and teachers. An e-mail link encourages feedback, and the public display makes the often-unavailable classroom bulletin board an additional resource for other teachers, educators, and researchers.

Use of Technology for Investigation and Documentation

This section describes the classroom where the technology has been used to document discussions, observations, predictions, stories, representations, and conversations during the course of project studies. With the aid of an audio recorder, a video recorder, a digital camera, and a 35mm camera, the documented materials can be displayed.

The computer is a tool that the 4-, 5-, and 6-year-old children use frequently to communicate their project's progress. The children write questions that they have about the project as well as their predictions and reports of what they found out. Most children appear comfortable using word-processing software, saving on a disk, and printing. A few children serve as mentors and assist others when there is a problem, even before the teacher is called.

Investigation

The computer also serves as one of the methods for investigating small-group or self-initiated projects. Children meet with the teacher to formulate the question that they wish to investigate. At that time, the teacher and child discuss what the child already knows about the subject matter and the ways in which she or he can research it. A list is generated that often includes searching on the World Wide Web for information and pictures. The children also decide in this planning stage how they want to report their research findings to the rest of the class. They choose from a long list of possible methods of presentation, including making a book or a script for a play or puppet show. Once again, the computer plays a significant role in allowing the child to create a book or script with type that looks neat and professional. The computer supports this

project-based, student-centered early childhood classroom in a way that allows children to pursue investigations in a more independent and engaging way. This independence allows children to work at their own rate rather than wait for a teacher or parent volunteer to write the questions for them, take dictation, or type the books when time permits. This independence also frees the adults in the room to engage in questioning and meaningful dialogue to help further and deepen the investigations.

Documentation

Documentation helps to "capture the moments" in order for the teacher to recall, comprehend, and prepare activities to facilitate the learning of concepts related to the project. "The documentation is used by the teachers to study children's ideas and approaches to learning. Such study can enable teachers to better know how to further support children in formulating and answering their own questions. The documentation can be used with children to help them revisit, reflect, and reconstruct" (Fyfe, 1994). The technology that assists the teacher in gathering documentation is vital. Often a video camera is best at Activity Time when lots of conversation is going on. In a whole class discussion, an audio tape recorder is moved around close to the speaker to catch the discussion. These conversations are then transcribed by the teacher to document concepts and thinking at that particular place and time, as well as to have a conversation with the child and read the conversations back to see if that is what they meant to say or for the child to clarify thinking. In addition, the conversation can be displayed on the bulletin boards and Knowledge Webs for parents to see what their child was thinking and how they expressed themselves on a particular day. Pictures taken with a 35mm camera or digital camera supplement the conversation and record the project in action, because a picture is worth a thousand words.

A wall display highlights the documentation of the stages or phases in the project investigation. The purpose of the display is to communicate understandings and to serve as a source of information. The public display provides a vehicle to connect parents not only to their own child's work but also to the work of other children. The display is important in communicating all phases of project work. The display for Phase 1 shows children's experiences prior to the study. In Phase 2, the display shares the processes of gaining new understandings through field work, research, representation, and follow-up activities. The documentation may show children interacting to solve a problem or present photos in a time sequence to show the steps a child uses in the investigation. The displays need to be aesthetically pleasing to invite parents, dropping off or picking up their child, to look at the documentation and materials presented, thereby facilitating communication between parent and child.

The documented conversations, representations, predictions, investigations, and photos are gathered for the third phase and final display of the project. Items are chosen by children and teachers that will best tell the whole story of "how" the children learned about the topic. Once again, families are invited to share in celebrating the knowledge, skills, and dispositions acquired through the project investigation. Technology (computers, cameras, and recorders) is valuable in assisting with the project, thereby helping connect education and families.

Photo Portfolios

Photo portfolios are collections of photographs assembled to tell about the life of a particular child, a particular project, or a particular phenomenon in the classroom. With photographs, teachers can document the intangible aspects of a child's daily activities—the smiles, friendships, patterns of choices, engagement, concentration, and intensity of a child's interest (Toren, 1997). Over the course of 2 years, the teachers have been refining their collection of photo portfolios and using them as tools to discuss the child's progress at parent conferences, to show the progression of one child through a project, or to demonstrate concepts across all children (for example, how many students represented symmetry in their representations). Photographs became tools for assessment, reflection, documentation, and communication.

Photographs enable the teachers to document events chronologically, providing them with a means to show parents and the public their investigative activities such as field trips, guest speakers, and field work. Individual portfolios may demonstrate to parents their children's learning styles, preferences, friendships, and strengths. One child's portfolio may exemplify her creative ability and her desire to work with artistic mediums. Another child's portfolio may demonstrate the active

nature of the child, the preference for using the "dramatic play area," or an interest in animals. The portfolios enable the parents to see the child in much the same way as the teacher does—how the child spends his or her time in school, and how the child demonstrates his or her interests and abilities in social or group situations. Photo portfolios are an addition to the child's cumulative portfolio and not a substitution for collected work samples, assessments, and artistic representations.

Chickscope

Chickscope was a collaborative project with many departmental units at the University of Illinois at Urbana-Champaign, the Champaign County Extension Unit, and the Beckman Institute. It provided students an opportunity to use interactive, real-time Magnetic Resonance Imaging (MRI) to view developing chicken embryos simultaneously while incubating eggs in their classrooms. University Primary School students were taught to manipulate the MRI scanner, which is housed at the National Center for Supercomputing Applications (NCSA), to study different views of the developing embryos. The students were "online" twice weekly throughout the incubation period, scanning in real time. Students at UPS were one of ten participating school sites. They had the opportunity through the Internet and their own home page to communicate their findings and questions with other students and the professionals supervising the project. They celebrated the birth of the chicks with a birthday party. More information about the entire project is described in Bruce et al. (1997).

Concluding Remarks

The tremendous advances in technology have eliminated the traditional boundaries of the classroom. At UPS, we have found that using this technology has been beneficial to the students' education. With computers, students are now able to operate sophisticated equipment like an MRI, search for information online, record their experiences, and communicate with individuals outside their classroom. Computer technology has also brought the classroom to the home through the use of Web pages as a virtual bulletin board. Digital cameras, scanners, and videotape photography are vital to the documentation and learning processes. Each of these items paints a different portrait of knowledge, dispositions, skills, and experiences that are being developed within the curriculum. As a result, parents, students, educators, and researchers can share the experiences that were once only viewed by those in the classroom. However, we have only touched the surface of what can be done with multimedia technology, and continued exploration and expansion of the uses of technology are essential to the vitality of the classroom.

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APPENDIX

Computer Resources Used to Create the Knowledge Web Pages

- Hardware

  Computer: IBM 486 processor with at least 16M RAM (a Pentium with 32M RAM is preferred), 1G hard drive (a zip drive is useful for archiving images)

  Flatbed scanner for scanning photos and original work.

  Digital camera (or a still camera and opting for photos on disk during development).

  Video camera for recording video images and sound

  Tape recorder for recording sound bites

- Software

  HTML editor from a commercial word-processing package such as WordPerfect® or a Web page editor such as MicroSoft FrontPage® 97.

Image editor that can save images/pictures in *.jpg or *.gif formats.

Scanner software, which usually comes with the scanner and interfaces with the image-editing software.

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